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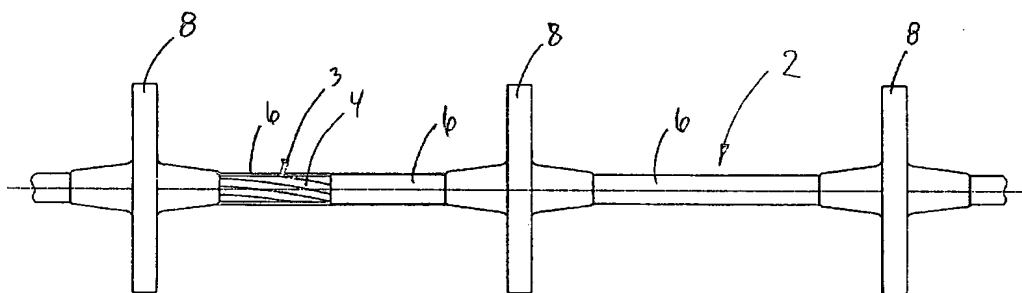
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- (71) Applicant (for all designated States except US): DALTEC A/S [DK/DK]; Tybovej 1, DK-6040 Egtved (DK).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): DALL, Thøge, Hellesøe [DK/DK]; Aftensang 22, DK-6040 Egtved (DK).
- (74) Agent: PATRADE A/S; Fredens Torv 3A, DK-8000 Aarhus C (DK).
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(54) Title: CONVEYING WIRE



(57) Abstract: Conveying wire (2) with disc-shaped conveying members (8) for use in endless tube conveyor systems, the wire (3) consisting of a number of twisted strands (4) that each are made of thin threads or fibres, and including an outer jacket (6) to which the said conveying members (8) are fastened directly by injection moulding, where the said outer jacket (6) consists of a polymer with a melting temperature which is lower than the melting temperature of the plastic material from which the conveying members are injection moulded, and where the wire (3) e.g. is made as a balanced (torsionally neutral) wire consisting of at least three strands that each are made of very thin synthetic fibres which are individually surface treated with a polymer, providing great bending wearability to the fibres and good adhesion to the outer jacket (6) which consists of a polymer. The fact that the melting temperature of the disc material is higher than the melting temperature of jacket material entails hence a local softening of the outer jacket locally at the conveying members, so that an almost optimally good connection between the conveying members and the wire via the outer jacket is established.

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Conveying Wire

Field of the Invention

5 The present invention concerns a conveying wire with disc-shaped conveying members for use in endless tube conveyor systems, the wire consisting of a number of twisted strands that each are made of thin threads or fibres, and including an outer jacket to which the said conveying members are fastened directly by injection moulding.

10 Background of the Invention

EP-A1-0 659 661 describes a conveying cable made of polyester fibres, and which is intended for use by transporting material in tube conveying systems, where disc-shaped conveying members of polyurethane are fastened directly on an outer sheath which also consists of polyurethane.

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The use of materials with the same melting temperature (same material) for both outer jacket and the disc-shaped conveying members has the drawback that sufficient adhesion via the jacket between conveying members and the fibres of the conveying wire is not achieved. This results in that the conveying members are having too inferior adhesion during use and are therefore displaced under load so that the jacket is destroyed also.

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On that background, it is the purpose of the invention to provide an improved transport wire of the kind mentioned in the introduction, and which in a simple way enables achieving a quite extraordinary adhesion of the disc-shaped conveying members through the outer jacket and onto the fibres of the conveying wire.

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Summary of the Invention

30 The conveying wire according to the invention is characterised in that the said outer jacket consists of a polymer with a melting temperature which is lower than the melting temperature of the plastic material from which the conveying members are injection moulded. In a particularly simple way is hereby achieved a quite extraordinary

good adhesion between the disc-shaped conveying members via the outer jacket to the fibres in the wire. The fact that the melting temperature of the disc material is higher than the melting temperature of jacket material implies a softening of the outer jacket locally at the conveying members, so that an almost optimally good connection between the conveying members and the wire via the outer jacket is established.

In general, it is furthermore very advantageous to be able to operate with a conveying wire, where the outer jacket as well as the conveying members are made of materials approved for use with handling foodstuffs.

The conveying wire according to the invention is suitably designed so that the said conveying members consist of synthetics with a melting temperature which is 10 - 40°C higher than the melting temperature of the outer jacket which consists of a polymer. In other words, there is a rather small, yet sufficient difference in melting temperature of the conveying members and the outer jacket, respectively.

The conveying wire according to the invention is, however, preferably designed so that the said conveying members consist of polyamide (nylon) with a melting temperature which is 20 - 30°C higher than the melting temperature of the outer jacket which consists of polyurethane.

Suitably, the conveying wire according to the invention is furthermore designed so that the wire is made as a balanced (torsionally neutral) wire consisting of at least three strands that each are made of very thin synthetic fibres which are individually surface treated with a polymer, providing great bending wearability to the fibres and good adhesion to the outer jacket which consists of a polymer. In that connection it is, of course, very important that a very good adhesion between the strands of the wire itself and the outer jacket is ensured, so that the connection between the wire and the conveying members is also thereby stable and optimal.

A conveying wire of the actual type, where the wire consists of synthetic fibres, is furthermore very advantageous since its dead weight is much reduced compared with

a usual conveying wire, were the basic wire consist of steel wire.

Most suitably, the conveying wire according to the invention is designed so that it is made as a balanced (torsionally neutral) wire consisting of at least seven strands that each are made of very thin paraamide fibres which are individually surface treated with a polymer providing great bending wearability to the fibres and good adhesion to the outer jacket which consists of a polyurethane. A further, very important advantage of a conveying wire with a basic wire of synthetic fibres and a smooth outer jacket and smooth conveying members connected therewith is that the conveying wire is very easy to keep clean and very easy to clean, e.g. by passing an automatic cleaning station.

With the purpose of minimising extending of the conveying wire, according to the invention this may advantageously be designed so that the wire is made with strands with lays having a length of the magnitude 50 - 150 mm, preferably about 100 mm, so that elongation of the wire is minimised.

Compared with prior art fibre wires of the kind in question, a very important advantage is hereby achieved, namely high rigidity that enables pushing the conveying wire according to the invention through pipe sections, in contrast to other known, braided fibre wires without outer jacket which are so soft and bendable that it is quite impossible to push them through even relative short pipe sections, i.e. that prior art braided fibre wires without outer jacket have to be pulled through pipe sections, which is a relatively cumbersome and time-consuming operation.

Alternatively, the conveying wire according to the invention can be made as a balanced, i.e. torsionally neutral, wire, preferably consisting of 7 strands that each are made of thin threads of steel, where the wire under heating by extrusion has been provided with the said outer jacket consisting of polyurethane and which thereby has been integrated with the wire.

The conveying wire according to the invention has in other words appeared to have

extremely good properties in use, characterised by:

- that it can be made of food approved materials,
- that it has less longitudinal expansion due to tensile action and is easy to keep tensioned,
- 5 - that it has less weight, which compared with large flexibility and less bending force means that a system can have 20% more corners, and that it is unproblematic to have several turns after each other,
- that it has better coating with a smooth surface and which keeps itself clean even by moist material,
- 10 - that it has great durability - a factor 8 compared with known conveying wires.

Short Description of the Drawing

The invention is explained in more detail in the following in connection with the drawing that shows a side view of an embodiment of a conveying wire according to
15 the invention.

Detailed Description of the Invention

The conveying wire 2 shown on the drawing is made as a balanced, i.e. torsionally neutral, wire 3 consisting of a number of strands 4, e.g. seven strands 4, each consisting of a very large number of thin fibres of paraamide that are individually designed
20 with a finish and provided with a surface coating with a polymer that has the purpose of ensuring large wearability at bends, long service life and extraordinary good adhesion to the outer jacket 6 which consists of polyurethane.

25 By the individual fibres of the strands 4 being surface treated with the said polymer, there is simultaneously achieved an optimal surface treatment of the strands 4 so that the adhesion between the wire 2 and the outer jacket is optimal, which in turn means an optimal force transmission between the wire 2 and the disc-shaped conveying
members 8 which are produced by injection moulding directly onto the outer jacket 6.

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The conveying members 8 consist of polyamide (nylon) having a melting temperature which is 20-30°C higher than the melting temperature of the outer jacket 6 which, as

mentioned, consists of polyurethane. By injection moulding the conveying members 8 directly upon the outer jacket 6, a very short-termed heating and softening of the outer jacket 6 in the contact area with the conveying discs 8 occurs, so that the latter achieve better contact via the outer jacket 6 to the fibres of the conveying wire.

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By tests it has furthermore been ascertained that the elongation of the wire varies between about 0.32% at a tensile force of 1000 N and about 1.4% at a tensile force of 5000N, as the wire as a whole has a tensile strength of the magnitude 30,000N. Other experiments have shown that for pulling a disc-shaped conveying member off the conveying wire, a tensile force in the magnitude 1700 - 2000N is required.

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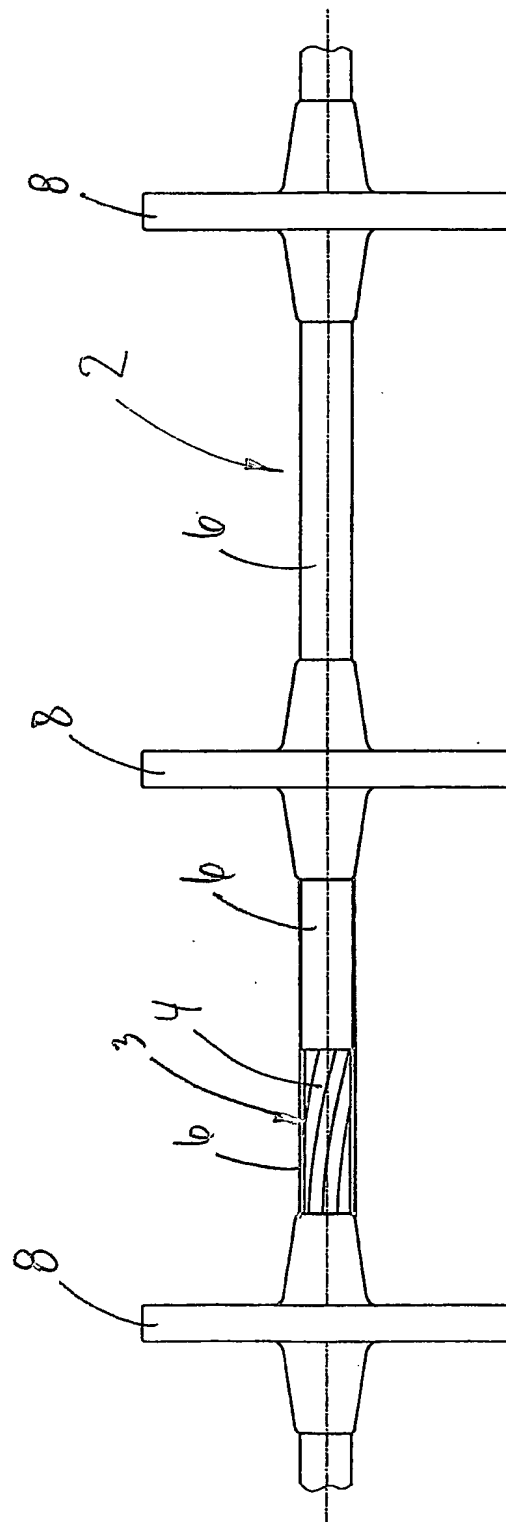
CLAIMS

1. Conveying wire with disc-shaped conveying members for use in endless tube conveyor systems, the wire consisting of a number of twisted strands that each are made of thin threads or fibres, and including an outer jacket to which the said conveying members are fastened directly by injection moulding, **characterised in that** the said outer jacket consists of a polymer with a melting temperature which is lower than the melting temperature of the plastic material from which the conveying members are injection moulded.
2. Conveying wire according to claim 1, **characterised in that** the said conveying members consists of synthetic material with a melting temperature which is 10 - 40°C higher than the melting temperature of the outer jacket which consists of a polymer.
3. Conveying wire according to claim 1 - 2, **characterised in that** the said conveying members consist of polyamide (nylon) with a melting temperature which is 20 - 30°C higher than the melting temperature of the outer jacket which consists of polyurethane.
4. Conveying wire according to claim 1, **characterised in that** the wire is made as a balanced (torsionally neutral) wire consisting of at least three strands that each are made of very thin synthetic fibres which are individually surface treated with a polymer, providing great bending wearability to the fibres and good adhesion to the outer jacket which consists of a polymer.
5. Conveying wire according to claim 1 and 4, **characterised in that** the wire is made as a balanced (torsionally neutral) wire consisting of at least seven strands that each are made of very thin paraamide fibres which are individually surface treated with a polymer providing great bending wearability to the fibres and good adhesion to the outer jacket which consists of a polyurethane.
6. Conveying wire according to claim 1, **characterised in that** the wire is made with strands with lays having a length of the magnitude 50 - 150 mm, preferably about 100

mm, so that elongation of the wire is minimised.

- 5 7. Conveying wire according to claim 1, **characterised in that** the wire is made as a balanced (torsionally neutral) wire consisting of a number of strands that each are made of thin threads of steel, where the wire under heating by extrusion has been provided with the said outer jacket consisting of polyurethane and which thereby has been integrated with the wire.

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ATTACHMENT

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1. International Publication No. WO 2004/065269 A1 – Full Copy
2. PCT International Preliminary Report on Patentability;
3. International Search Report